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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/649,086	08/26/2003	Steven J. Keating	042390.P6134D	4927

7590 07/13/2005

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EXAMINER

OWENS, DOUGLAS W

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 07/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/649,086

Applicant(s)

KEATING ET.AL.

Examiner

Douglas W. Owens

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 27-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8, 27-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 27, 2005 has been entered.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Objections

3. Claim 30 is objected to because of the following informalities: The phrase --in thickness-- or a similar phrase should be inserted after "Angstroms". Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1 – 8 and 27 – 31 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably

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convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 1 and 8 require that the nitridized hydroxyl-silicate layer exhibit low leakage current and high nitrogen concentration. These features have not been disclosed in the original specification.

Claim 29 requires that the hydroxyl-silicate layer is resistant to native oxide growth. This feature has not been disclosed in the original specification.

Claim 31 requires that the hydroxyl-silicate layer does not attract particles. This feature has not been disclosed in the original specification.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1 – 8 and 27 – 31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

8. The term "high nitrogen concentration" in claims 1 and 8 is a relative term which renders the claim indefinite. The term "high" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

10. Claims 1, 2, 4 – 8, 27 and 29 – 31 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent No. 6,197,668 to Gardner et al.

Regarding claims 1 and 2, Gardner et al. teach a microelectronic device (Figs. 1 – 2B, for example), comprising:

a semiconductor substrate (10); and

a dielectric layer comprising silicon oxynitride (Col. 3, lines 6 – 8; (30)), which would have exhibited low leakage current and high nitrogen concentration.

The limitation of the nitridized hydroxyl-silicate layer is considered to be merely a reference to the composition. In such a case, the silicon oxynitride layer (nitridized hydroxyl-silicate layer) taught by Gardner et al. is essentially a hydroxyl-silicate layer that has been “nitridized” as it was formed.

Gardner et al. further teaches that the silicon oxynitride layer can be grown from the substrate (Col. 3, lines 6 – 10). Growing the layer from the substrate would have required nitridizing the hydroxyl-silicate layer as it was grown.

Regarding claim 4, Gardner et al. teach a microelectronic device, wherein the nitridized hydroxy-silicate layer has a typical thickness of about 4 Angstroms, which is less than approximately 7 Angstroms (Col. 3, lines 33 – 34; Col. 4, lines 5 – 7).

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Regarding claim 5, Gardner et al. inherently teach a microelectronic device, wherein the substrate comprises a silicon wafer since a silicon wafer is required for the manufacture of microelectronic devices of this type.

Regarding claim 6, Gardner et al. teach a microelectronic device, further comprising a gate electrode (32) over the nitridized hydroxyl-silicate layer.

Regarding claim 7, Gardner et al. teach a microelectronic device, further comprising a pair of source/drain terminals (16A, 18A) disposed in the semiconductor substrate, substantially adjacent to the gate electrode.

Regarding claim 8, Gardner et al. teach a field effect transistor, comprising:

a gate electrode (32);

a pair of source/drain terminals (16A, 18A) disposed in a substrate, substantially adjacent the gate electrode; and

a gate dielectric (30) disposed between the gate electrode and the substrate, the gate dielectric comprising a nitridized hydroxyl-silicate layer (Col. 3, lines 6 – 10), which would have exhibited low leakage current and high nitrogen concentration.

Regarding claim 27, Gardner et al. teach a microelectronic device, wherein the dielectric constant of the nitridized hydroxyl-silicate layer is greater than the dielectric constant of silicon dioxide, since this is a property of the material used.

Regarding claim 29, Gardner et al. inherently teach a microelectronic device, wherein the nitridized hydroxyl-silicate layer is resistant to native oxide growth, since native oxide typically grows on the substrate.

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Regarding claim 30, Gardner et al. teach a field effect transistor, wherein the thickness of the hydroxy-silicate layer is about 4 Angstroms, which is less than approximately 7 Angstroms (Col. 3, lines 33 – 34; Col. 4, lines 5 – 7).

Regarding claim 31, Gardner et al. teach a field effect transistor, wherein the nitridized hydroxyl-silicate layer inherently does not attract particles, since this is a property of the material used.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al. as applied to claims 1 and 2 above, and further in view of US Patent No. 6,013,582 to Ionov et al.

Gardner et al. do not teach a device, wherein the silicon oxynitride is a material in accordance with the expression $\text{SiO}_x\text{N}_{(4-2x)/3}$ where $0 \leq x \leq 2$. Indeed, Gardner et al. is completely silent with respect to the precise composition of the silicon oxynitride material. Ionov et al. teach that silicon oxynitride typical has a composition of $\text{SiO}_x\text{N}_y\text{H}_z$, where x ranges from 0 to about 2, y ranges from 0 to 1 and z ranges from 0 to 1 (Col. 1, lines 55 – 58). If x were set at 1.5, for example, the expression $(4-2x)/3$ would be 1, which lies within the range of y for a typical composition of silicon oxynitride. It would have been obvious to one of ordinary skill in the art to incorporate the typical silicon

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oxynitride composition taught by Ionov et al. into the device taught by Gardner et al., since it is desirable to select a composition of silicon oxynitride that is known to be a reliable insulator.

Response to Arguments

13. Applicant's arguments filed June 27, 2005 have been fully considered but they are not persuasive.

Applicant argues that the claimed invention is significantly different than the invention of Gardner et al., yet has not claimed those differences.

Applicant further asserts that it is necessary to claim the invention according to the process because it cannot be claimed structurally. The broadly claimed product-by-process limitation of a "nitridized hydroxyl-silicate layer" does not distinguish the claimed invention from that of Gardner et al. since Gardner et al. also teaches a nitridized hydroxyl-silicate layer. Although Gardner et al. nitridizes the hydroxyl-silicate layer by a different method than that of the claimed invention, there is no distinction in the claims between the invention of Gardner et al. and the claimed invention.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W. Owens whose telephone number is 571-272-1662. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, reading "Douglas W. Owens". The signature is written in a cursive, flowing style.

Douglas W Owens
Examiner
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DWO